

REMARKS

Claims 1, 2, 7-11, 13 and 15-26 are pending in the present application for further prosecution. Applicants submit arguments for overcoming the rejections based on the prior art of record. Accordingly, Applicants respectfully submit that claims 1, 2, 7-11, 13 and 15-26 are in condition for allowance.

I. Claim Rejection - 35 USC §103(a)

- A. *In the non-final Office Action dated September 26, 2011, claims 1, 2, 7-11, 13, 17-23 and 26 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,619,537 B1 issued to Zhang et al. in view of in view of JP 03-079734 A (Fukuda) and further in view of JP 10-168532 A (Honjo et al.).*

All claims of the present application require a copper alloy backing plate of specified composition to be bonded or diffusion bonded directly to a rear face of a copper or copper alloy sputtering target. The backing plate is required to be directly bonded or diffusion bonded to the rear face of the sputtering target (i.e., no intervening or intermediate layer extends or is sandwiched between the sputtering target and backing plate).

Argument with Respect to Teaching-Away

The following argument was presented in Applicants' previous response and is being repeated herein for reconsideration. Case law supporting this argument is provided and discussed thereafter.

"Teaching away" is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, "teaching away" is a per se demonstration of lack of obviousness. For "teaching-away" to occur, subject matter must first be disclosed and then be criticized, discredited or discouraged.

The primary reference of the §103(a) rejection, Zhang et al., discloses a bonding surface (18) of a copper alloy backing plate (16) diffusion-bonded to a back face (14) of a high purity copper alloy sputtering surface via an intervening layer (20). For example, see the following sections of Zhang et al.:

ABSTRACT - “A sputter target assembly including a high purity copper sputter target diffusion bonded to a backing plate, preferably composed of either aluminum, aluminum alloy, aluminum matrix composite materials, copper, or copper alloy, *and a Ni-alloy interlayer*, preferably composed of Ni-V, Ni-Ti, Ni-Cr, or Ni-Si, *located between and joining the target and backing plate*, and a method for making the assembly. The method of making involves *depositing (e.g., electroplating, sputtering, plasma spraying) the interlayer on a mating surface of either the sputter target or backing plate* and pressing, such as hot isostatically pressing, the sputter target and backing plate together along mating surfaces so as to form a diffusion bonded sputter target assembly.”

COLUMN 2, LINE 63, TO COLUMN 3, LINE 5 – “The present invention provides a sputter target/backing plate assembly comprising a sputter target composed of copper and alloys thereof, most preferably high-purity copper, a backing plate composed of a metallic material, preferably aluminum, aluminum alloy, aluminum matrix composite materials, copper, or copper alloys, *and an interlayer between the target and backing plate* wherein *the interlayer, target, and backing plate are diffusion bonded together*. The interlayer is composed of a Ni-alloy, preferably Ni-V, Ni-Ti, Ni-Cr, and Ni-Si.”

COLUMN 4, LINES 33-39 – “Referring to FIG. 1, a sputter target assembly 10 includes a target 12 defining a first mating surface 14, a backing plate 16 defining a second mating surface 18, *and an interlayer 20 between the first and second mating surfaces 14, 18* wherein the interlayer 20, target 12, and backing plate 16 are diffusion bonded together.”

Zhang et al. also disclose a sputtering target and backing plate that are directly diffusion bonded together without an intervening layer (20). For instance, column 1, lines 57-65, states as follows:

“With respect to sputter target assemblies used during sputtering processes, more specifically to copper target assemblies, *these assemblies historically have been made by bonding a high-purity Cu plate to a lightweight and highly heat conductive backing plate*, such as Al, aluminum alloy, or aluminum matrix composite materials. Additionally, Cu targets may be bonded to a Cu, or Cu alloy, backing plate in forming target assemblies. Two methods used in bonding Cu targets are solder bonding and diffusion bonding.”

However, Zhang et al. provide a clear teaching to one of ordinary skill in the art that teaches away from “these assemblies”. For example, see column 2, lines 9-24, which states, as follows:

“However, the bond between a Cu target and backing plates formed of various metallic materials may produce very brittle intermetallic compounds during the bonding process resulting in a weak bond. Specifically, the bond between Cu and Al produced by diffusion bonding is extremely weak due to the fact that Cu and Al form several very brittle intermetallic compounds during the bonding process. These brittle interphases tend to reduce the mechanical load necessary to initiate failure during tensile testing, for example, copper and aluminum are capable of forming a low temperature intermetallic phase incapable of withstanding a tensile stress greater than approximately 2 ksi (1.4×10^7 N/m²).

To eliminate this intermetallic interphase and improve bond strength, it is necessary to use an interlayer, such as Ni or Ti, between the target and backing plate.”

Accordingly, Zhang et al. clearly teach the direct bonding of a sputtering target to a backing plate will create a brittle intermediate phase at the bonded surfaces that greatly deteriorates bonding strength. Thus, Zhang et al. clearly criticize, discredit and discourage such an assembly and direct one of ordinary skill in the art not to directly diffusion bond the sputtering target to the backing plate. Rather, Zhang et al. direct one of ordinary skill in the art to bond the sputtering target to the backing plate via an intervening layer or interlayer (20) of Ni or Ti. Zhang et al. teach to one of ordinary skill in the art that the intervening layer (20) is “necessary” (not optional).

The Examiner’s Position Stated in the Office Action of September 26, 2011

With respect to Applicants’ argument relative to the fact that Zhang et al. teach-away from the claimed invention, the following is stated in the Office Action dated September 26, 2011:

“On p. 2-9, the Applicant argues that Zhang et al. teaches away from directly bonding the sputtering target to the backing plate.

The Examiner respectfully disagrees. It has been held that ‘patents are relevant as prior art for all they contain, with the use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain’. See MPEP 2123, Section I; MPEP 2145, Section X, Part D, #1. Therefore, Zhang et al. does teach that it is known in the prior art to use diffusion bonding to directly bond the sputter target of Cu alloy to a backing plate of a Cu alloy (abstract,; col. 1, lines 56-57; col. 2, lines 1-21) despite the invention of Zhang et al being directed to using an interlayer of Ni or Ti between the sputter target and backing plate as argued by the Applicant.”

Applicants respectfully submit that the above statements and conclusions are in error.

According to these statements, there can never be a “teaching away” because the very thing that is being taught away from, by definition, must necessarily first be disclosed. Applicants respectfully submit that the Examiner’s position stated in the Office Action is incorrect and inconsistent with valid case law provided by the Federal Circuit. Accordingly, Applicants respectfully request reconsideration of the clear teaching-away provided by the teachings of the Zhang et al. patent to one of ordinary skill in the art at the time of the invention was made (i.e., it is “necessary” to use an intervening layer (20)).

In re Fulton, 391 F.3d 1195, 73 USPQ2d 1141 (Fed Cir. 2004)

A copy of In re Fulton is attached for the Examiner’s review.

In re Fulton (and In re Gurley discussed in In re Fulton) discloses two possible scenarios.

In a first scenario, a prior art reference may disclose a series of alternatives and may not otherwise criticize, discredit or discourage any of the identified alternatives. In this case, it is clear from In re Fulton and In re Gurley that “the prior art’s mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives”. However, this is not the case presented by the facts herein with respect to the present application and the citation

of the Zhang et al. patent. Zhang et al. do not merely disclose alternatives without criticizing, discrediting or otherwise discouraging the alternative.

Rather, the facts presented by the prosecution of the claims of the present application relate more closely to a second scenario discussed by In re Fulton and In re Gurley. On page 8 of In re Fulton, In re Gurley is discussed as follows:

“[a] reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by Applicant. 27 F.3d at 553.”

As discussed above, Zhang et al. disclose an alternative of directly bonding a backing plate to a sputtering target without an intervening layer. See column 1, lines 57-65, of the Zhang et al. patent. However, Zhang et al. clearly discourage, discredit and criticize such an alternative. For example, see column 2, lines 9-24, which states, as follows:

“However, the bond between a Cu target and backing plates formed of various metallic materials may produce very brittle intermetallic compounds during the bonding process resulting in a weak bond. Specifically, the bond between Cu and Al produced by diffusion bonding is extremely weak due to the fact that Cu and Al form several very brittle intermetallic compounds during the bonding process. These brittle interphases tend to reduce the mechanical load necessary to initiate failure during tensile testing, for example, copper and aluminum are capable of forming a low temperature intermetallic phase incapable of withstanding a tensile stress greater than approximately 2 ksi (1.4×10^7 N/m²).

To eliminate this intermetallic interphase and improve bond strength, it is necessary to use an interlayer, such as Ni or Ti, between the target and backing plate.”

Thus, it cannot be said that the facts presented by the present rejection are consistent with a disclosure of alternatives that are not criticized, discredited and discouraged; rather, Zhang et al. clearly does criticize, discredit and discourage a direct bonding alternative.

Based on the case law provided by the Federal Circuit in both In re Fulton and In re Gurley, it is clear that Zhang et al. teach away from the subject matter of the claims of the present application. This is because Zhang et al. disclose an alternative and then criticize,

discredit and discourage use of such an alternative. Thus, Applicants respectfully request reconsideration of the patentability argument based on teaching away which remains a legitimate argument to a rejection based on obviousness. Accordingly, Applicants respectfully request that the above referenced rejection be withdrawn since claims 1, 2, 7-11, 13, 17-23 and 26 are patentable over Zhang et al. in view of Fukuda and further in view of Honjo et al. because the primary reference, Zhang et al., teaches away from the subject matter required by the claims of the present application and criticizes, discredits and discourages such an arrangement.

Additional Argument for Patentability – Ni Content

The Ni content of the copper alloy backing plate (that is directly bonded to the copper or copper alloy sputtering target without any intervening layers) required by independent claims 1 and 17 of the present application is 2-4wt%. It is clear that Zhang et al. fail to disclose a copper alloy backing plate having 2-4wt% Ni directly bonded to a sputtering target. It is also admitted in the Office Action that JP '734 (Fukuda) fails to disclose a composition in which Ni is included.

JP '532 (Honjo et al.) discloses a copper alloy composition having “one or more kinds among Zn, Sn, Ni ... and Ag by 0.001 to 1.0% in total”. Thus, at most, Honjo et al. teach 1.0% Ni and clearly fail to teach 2-4wt% Ni required by the claims of the present application.

Accordingly, Applicants respectfully request that the above referenced rejection be withdrawn since claims 1, 2, 7-11, 13, 17-23 and 26 are patentable and non-obvious over Zhang et al. in view of Fukuda and further in view of Honjo et al. because the references fail to disclose the claimed composition of the backing plate.

Additional Argument for Patentability – Claimed Composition Not Obvious

Applicants respectfully submit that each of Fukuda and Honjo et al. require different elements to be essential. For this reason, Applicants respectfully submit that one of ordinary skill in art would not find it obvious to arrive at the composition required by independent claims 1 and 17 of the present application.

In the Office Action, the Examiner argues, as follows:

“... Fukuda teaches the Cu alloy comprising Cr in addition to Sn, Mg and Si (abstract), and Honjo et al. teaching the Cu alloy comprises Co and P in addition to Sn, Ni, Si, Cr, and Mg (abstract). Therefore, Honjo et al. and Fukuda teach the Cu alloy for the backing plate comprising overlapping materials”.

Applicants respectfully submit that, even if some of the elements overlap, there are essential elements (such as Co and P) that do not overlap. Applicants respectfully submit that it would not be obvious to one of ordinary skill in the art not to include an element indicated as essential according to at least one of the references in a “combined” composition. Thus, an alloy made by one of ordinary skill in the art based on the combination of Fukuda and Honjo et al. would not be the same as the composition claimed in at least some of the claims of the present application. For example, see the compositions required by claims 22 and 23 of the present application.

Accordingly, even if the compositions of Fukuda and Honjo et al. are combined, it would not be obvious to produce the composition required by the claims of the present application for the backing plate. Applicants respectfully request reconsideration.

- B. In the non-final Office Action dated September 26, 2011, claims 15, 16 and 24 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,619,537 B1 issued to Zhang et al. in view of JP 01-180976 A of Ishikura.*

As discussed above, Zhang et al. teach away from direct bonding of a backing plate to a target; rather, Zhang et al. direct one of ordinary skill in the art that it is “necessary” to use an interlayer therebetween and criticizes, discredits and discourages direct bonding of a sputtering target to a backing plate. See arguments and case law recited above.

Accordingly, for the same reasons discussed above for claims 1 and 17, Applicants respectfully request that the above referenced rejection be withdrawn since claims 15, 16 and 24 are patentable over Zhang et al. in view of Ishikawa because the primary reference, Zhang et al., teaches away from the subject matter required by the claims of the present application.

- C. In the non-final Office Action dated September 26, 2011, claim 25 is rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,619,537 B1 issued to Zhang et al. in view of JP 01-180976 A of Ishikura and further in view of JP 10-168532 A (Honjo et al.).*

Claim 25 requires a backing plate composition consisting of 97.6wt% Cu, 0.3wt% Be and 2.1wt% in total of Ni and Co. Ishikura discloses a backing plate consisting of Cu and Be. Honjo et al. is relied upon in the rejection for the addition of Ni and Co.

Applicants respectfully submit that the effect of the elements within the composition of Honjo et al. (JP ‘532) can only be expected by one of ordinary skill in the art to have the effect stated by Honjo et al. in the specific composition disclosed by the Honjo et al. reference. Thus, even if an additive element in Honjo et al. is added into the different alloy of Ishikura (JP ‘976), the resulting composition will clearly be different from the composition disclosed by Honjo et al. and it would be unclear and unexpected by one of ordinary skill in the art that the same effects achieved in the composition of Honjo et al. would be experienced in this new composition.

More specifically, the composition of Ishikura is provided to yield an effect of inhibiting the dispersion of Cu and preventing the target material from becoming thermally compression-bonded to the Cu substrate by adding Be. Applicants respectfully submit that it cannot be deduced and would not have been obvious for one of ordinary skill in the art to deduce at the time the present invention was made from this disclosure that the same effect described in Honjo et al. would be obtained in the composition of Ishikura by adding Ni and Co to such an entirely different composition.

Accordingly, for this reason and based on the teaching-away argument presented above with respect to the other rejections, Applicants respectfully submit that claim 25 is patentable over the cited references.

II. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Response to our deposit account no. 08-3040.

Respectfully submitted,
Howson & Howson LLP
Attorneys for Applicants

By /William Bak/
William Bak
Reg. No. 37,277
501 Office Center Drive
Suite 210
Fort Washington, PA 19034
(215) 540-9216

United States Court of Appeals for the Federal Circuit

04-1267
(Serial No. 09/122,198)

IN RE DANIEL S. FULTON and JAMES HUANG

Garth E. Janke, Birdwell & Janke, of Portland, Oregon, for appellants.

John M. Whealan, Solicitor, United States Patent and Trademark Office, of Arlington, Virginia, for the Director of the United States Patent and Trademark Office. With him on the brief were W. Asa Hutchinson III, Attorney-Advisor, and William LaMarca, Associate Solicitor.

Appealed from: United States Patent and Trademark Office
 Board of Patent Appeals and Interferences

United States Court of Appeals for the Federal Circuit

04-1267

IN RE DANIEL S. FULTON and JAMES HUANG

DECIDED: December 2, 2004

Before MICHEL, RADER, and GAJARSA, Circuit Judges.

MICHEL, Circuit Judge.

Appellants Daniel Fulton and James Huang appeal from the decision of the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences ("Board"), affirming the examiner's rejection of appellants' application for a utility patent on grounds that the invention claimed would have been obvious under 35 U.S.C. § 103(a). The appeal was submitted for decision without oral argument on November 5, 2004. Because the Board's finding that the prior art suggested the desirability of the combination of shoe sole limitations claimed in appellants' patent application was supported by substantial evidence, we affirm.

Background

On July 24, 1997, appellants filed application number 09/122,198 (the "'198 application") for a utility patent directed to a shoe sole with increased traction. Claim 1, the only independent claim at issue, reads:

An improved shoe sole for increasing the resistance to slip on a contact surface, the sole comprising a bottom surface and defining a perimeter bounding a forefoot portion corresponding to the forefoot of the shoe and a heel portion corresponding to the heel of the shoe, wherein the sole extends generally along a fore-aft axis running from said heel portion to said forefoot portion, the sole further comprising a substantially regular

tiling array of projections projecting from said bottom surface, said projections terminating in hexagonal shaped projected surfaces spaced from said bottom surface in a direction for making contact with the contact surface, said projections being oriented so that opposite edges of said projected surfaces face generally in the directions of said fore-aft axis, said projected surfaces being substantially flat and parallel to the bottom surface to maximize the area of contact with the contact surface, said projections being spaced from one another to define substantially continuous channels therebetween for conducting liquid, said channels being open over at least most of said perimeter, said forefoot portion and said heel portion of the sole.

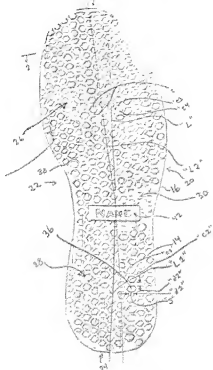
'198 application, at 7 (emphases added).

Three limitations of this claim are at issue, namely the limitations that: (A) the perimeter of the shoe is mostly open, (B) the projected surfaces, also called studs, are hexagonal in shape, and (C) the hexagonal shapes be oriented so that opposite edges of the hexagon "face generally in the directions of said fore-aft axis." Id. A figure from the '198 application is reproduced below, with non-substantive modifications for simplicity of presentation.

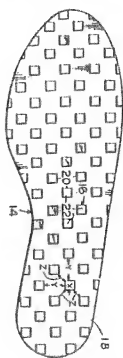
Prior art related to the '198 application includes U.S. Patent No. 3,793,750 ("Bowerman"), U.S. Design Patent No. 281,462 ("Pope"), U.S. Design Patent No. 263,645 ("Mastrantuone"), and United Kingdom Patent No. 513,375 ("Davies"). Figures from these patents are reproduced below.

As can be seen in the figures, the orientation of the projected surfaces in these figures is different. In this opinion, we will refer to the orientation in the '198 application, Bowerman, and Pope as a "facing" orientation because the front edge of each hexagonal projected surface faces forward and the orientation in Mastrantuone and Davies as a "pointing" orientation.

'198 application
(utility patent)



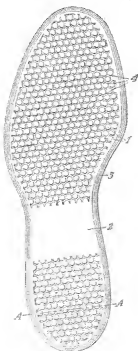
Bowerman
(utility patent)



Pope
(design patent)



Davies
(utility patent)



Mastrantuone
(design patent)



The examiner rejected the '198 application, inter alia, on obviousness grounds by considering Pope in light of Bowerman and Davies, and appellants appealed this rejection to the Board. In its decision, the Board reversed the examiner's ground for rejection, supplied an alternative ground for rejection, and remanded. After the Board entered its decision, appellants filed a request for rehearing. The panel held this motion for rehearing in abeyance while the examiner considered the application on remand. After reopening prosecution, the examiner rejected the '198 application for reasons identical to those offered by the Board in its first decision.

Appellants again appealed the examiner's rejection. In its decision, the Board "vacat[ed] the rejection of claim 1 set forth in the earlier decision in favor of the identical rejection later entered by the examiner." Ex parte Fulton, No. 2003-0536, slip op. at 4 (Bd. Pat. App. & Int. Sept. 11, 2003). The Board vacated the rejection in order to alleviate the confusion caused by the appellant in concurrently pursuing a request for a rehearing of the Board's first decision and a new appeal from the final rejection of the '198 application after remand. The Board credited the arguments in both actions. The Board then proceeded to affirm the rejection but under a different line of reasoning. The Board stated:

In the present case, the combined teachings of Bowerman and Pope would have suggested the shoe sole recited in claim 1 to a person having ordinary skill in the art. As indicated above, Bowerman's shoe sole responds to all of the limitations in the claim except for those relating to the hexagonal shaped projected surfaces. While not specifically mentioning hexagonal shaped projected surfaces, Bowerman clearly suggests that cylindrical polygon shaped studs or projections other than those expressly described (square, rectangular or triangular) may be employed to provide sharp edges which bite into artificial turf for good traction. Pope establishes that shoe soles having studs embodying projected surfaces hexagonally shaped and oriented as recited in claim 1 are conventional. Given these disclosures, a person having ordinary skill

in the art would have readily appreciated Pope's known hexagonal shaped projecting surfaces as being particularly well suited for implementing Bowerman's desire for projections having a plurality of sharp edges adapted to bite into artificial turf to obtain good traction. This appreciation would have furnished the artisan with ample suggestion or motivation to combine Bowerman and Pope in the manner proposed so as to arrive at the subject matter recited in claim 1.

Id. at 6-7. After appellants' request for a rehearing was denied, they appealed to this court, which has jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

Discussion

I.

"A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a).

Obviousness is a "question of law based on underlying findings of fact." In re Gartside, 203 F.3d 1305, 1316 (Fed. Cir. 2000). The Board's factual findings are upheld unless they are unsupported by substantial evidence. Id. Substantial evidence is "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." Consol. Edison Co. v. NLRB, 305 U.S. 197, 229-30 (1938). What the prior art teaches, whether it teaches away from the claimed invention, and whether it motivates a combination of teachings from different references are questions of fact. Id.; In re Berg, 320 F.3d 1310, 1312 (Fed. Cir. 2003). Other factual findings related to obviousness may include "(1) the scope and content of the prior art; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness." In re Dembiczak, 175 F.3d

994, 998 (Fed. Cir. 1999), abrogated on other grounds in In re Gartside, 203 F.3d 1305 (Fed. Cir. 2000) (abrogating the holding in In re Dembiczak that the Board's findings of fact are reviewed for clear error); see also Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966).

"When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references." In re Rouffet, 149 F.3d 1350, 1355 (Fed. Cir. 1998). Stated another way, the prior art as a whole must "suggest the desirability" of the combination. In re Beattie, 974 F.2d 1309, 1311 (Fed. Cir. 1992) (internal quotation omitted); Winner Int'l Royalty Corp. v. Wang, 202 F.3d 1340 (Fed. Cir. 2000) ("Trade-offs often concern what is feasible, not what is, on balance, desirable. Motivation to combine requires the latter." (emphasis added)). The source of the teaching, suggestion, or motivation may be "the nature of the problem," "the teachings of the pertinent references," or "the ordinary knowledge of those skilled in the art." In re Rouffet, 149 F.3d at 1355.

II.

As quoted above, the Board found that the prior art as a whole suggested or motivated a combination of the open perimeter and orientation of Bowerman with the hexagonal surface and orientation of Pope. Appellants raise a number of arguments as to why this finding is not supported by substantial evidence.

Appellants first argue that the Board's finding of a motivation to combine lacks substantial evidence because the Board failed to demonstrate that the characteristics disclosed in Pope, hexagonal surfaces in a facing orientation, are preferred over other alternatives disclosed in the prior art. This argument fails because our case law does

not require that a particular combination must be the preferred, or the most desirable, combination described in the prior art in order to provide motivation for the current invention. "[T]he question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination," not whether there is something in the prior art as a whole to suggest that the combination is the most desirable combination available. See In re Beattie, 974 F.2d at 1311 (internal quotation omitted; emphasis added). A case on point is In re Gurley, 27 F.3d 551, 552-53 (Fed. Cir. 1994), in which we upheld the Board's decision to reject, on obviousness grounds, the claims of a patent application directed to one of two alternative resins disclosed in a prior art reference, even though the reference described the resin claimed by Gurley as "inferior." Far from requiring that a disclosed combination be preferred in the prior art in order to be motivating, this court has held that "[a] known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use" and the reference "teaches that epoxy is usable and has been used for Gurley's purpose." Id. Thus, a finding that the prior art as a whole suggests the desirability of a particular combination need not be supported by a finding that the prior art suggests that the combination claimed by the patent applicant is the preferred, or most desirable, combination.

In this case, the Board found that "Bowerman clearly suggests that cylindrical polygon shaped studs or projections other than those expressly described (square, rectangular, or triangular) may be employed to provide sharp edges which bite into artificial turf for good traction." Ex parte Fulton, slip op. at 6-7. Bowerman thus provides a motivation to combine its teachings with other prior art references that disclose

cylindrical polygon shapes other than squares, triangles, and rectangles. The Board also found that Pope discloses a shoe sole with hexagonal surfaces, which is a cylindrical polygon-shaped surface, and a facing orientation. Finally, the Board found that no other prior art references taught away from the combination of Bowerman and Pope that it adopted. These secondary findings are sufficient to support a primary finding that the prior art as a whole suggests the desirability of the combination of Bowerman and Pope described by the Board.

Appellants disagree with the Board's finding that no prior art references taught away from the combination of Bowerman and Pope adopted by the Board. Appellants

quote language from In re Gurley that "[a] reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." 27 F.3d at 553. Appellants argue that "the

prior art disclosed alternatives to each of the claimed elements A [the perimeter], B [the shape of the surface], and C [the orientation of the surface]. Choosing one alternative necessarily means rejecting the other, i.e., following a path that is 'in a divergent direction from the path taken by the applicant.'" This interpretation of our case law fails. The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the '198 application. Indeed, in the case cited by appellants, In re Gurley, we held that the invention claimed in the patent application was unpatentable based primarily on a prior art reference that

disclosed two alternatives, one of which was the claimed alternative. Accordingly, mere disclosure of alternative designs does not teach away.

Here, the design patents in the prior art disclose a number of alternative shoe sole designs but do not teach that hexagonal projections in a facing orientation are undesirable and, therefore, do not teach away. Furthermore, Davies communicates in its specification that its claimed invention, which includes hexagonal surfaces in a pointing orientation, has "a non-skid characteristic effective in all directions relative to its use." U.K. Patent No. 513,375 (accepted Oct. 11, 1939) at 2, ll. 19-20. But Davies does not teach that hexagons in a facing orientation would be ineffective. Accordingly, we find unpersuasive appellants' arguments that the prior art teaches away from hexagonal surfaces in a facing orientation.

Appellants next contend that the Board's finding lacks substantial evidence because it does not show a teaching in the prior art directed to the importance of aligning the cylindrical polygonal studs in a facing orientation. In their patent application, appellants assert that "[t]his general orientation [a facing orientation] of the surfaces 36 has been found optimal for slip resistance in the sole of a shoe, in which there is a predetermined, usual or ordinary direction of travel." (Emphasis added.) Appellants' argument is unpersuasive from a legal standpoint because it again relies on the mistaken premise that the prior art must teach that a particular combination is preferred, or "optimal," for the combination to be obvious. Furthermore, as we emphasized in In re Beattie, "[a]s long as some motivation or suggestion to combine the references is provided by the prior art taken as a whole, the law does not require that the references be combined for the reasons contemplated by the inventor." 974 F.2d at

1312. Accordingly, this argument is unpersuasive because the Board need not have found the combination of Bowerman and Pope to be desirable for the reason stated in the '198 application.

This argument also fails on the facts of this case because the Board's findings are sufficiently broad to encompass appellants' idea of using a facing orientation because the predominant direction of travel is forward. The Board's finding that other cylindrical polygon shapes "may be employed to provide sharp edges which bite into artificial turf for good traction" suggests the importance of orientation because "bite" comes primarily from the front and back edges of the contact surface of a multi-sided stud being oriented so that the front edge faces the direction of travel and the back edge is directly opposite, as disclosed in Bowerman. See Bowerman, col. 2, ll. 55-60, figs. 2, 4. Indeed, in a discussion of "bite," Bowerman refers to Figures 2 and 4 of its specification, which depict a facing orientation. Id. Bite may also arise from the other edges of the contact surface, as well as edges formed by the intersection of the sides of the stud.

The Board also found that "a person having ordinary skill in the art would have readily appreciated Pope's known hexagonal shaped projecting surfaces as being particularly well suited for implementing Bowerman's desire for projections having a plurality of sharp edges adapted to bite into artificial turf to obtain good traction." Ex parte Fulton, slip op. at 6-7. Reasons why a hexagonal surface would be well-suited for obtaining good traction include the fact that the greater number of edges in a hexagon over a square provide bite in more directions. Further, although the Board's finding could perhaps have been clearer, it encompasses appellants' claim that a facing

orientation is desirable because it provides bite in the forward direction. The Board's finding states that a person of ordinary skill of the art would have recognized that hexagonal surfaces as in Pope are "particularly well suited" to provide bite. Id. By referring to Pope, which has a facing orientation, rather than patents in the examination record that disclosed a pointing orientation, the Board's finding recognizes the importance of a facing orientation and, therefore, also the importance of providing "bite" in the forward direction.

Appellants finally contend that the Board did not properly weigh the prior art as required by In re Young, 927 F.2d 588 (Fed. Cir. 1991), and did not provide sufficient reasoning for its rejection of these references as required by In re Lee, 277 F.3d 1338 (Fed. Cir. 2002). Although the Board's analysis is short, the Board's decision is not so lacking in comparative reasoning that it fails under In re Young or In re Lee. The Board clearly considered the prior art cited by appellants and provided a factual basis upon which we can affirm its decision.

III.

The Board sustained the examiner's rejection of the dependent claims of the '198 application because "appellants have not challenged such with any reasonable specificity, thereby allowing these claims to stand or fall with parent claim 1." Ex parte Fulton, slip op. at 8. In its briefing before this court, appellants have also not raised any arguments related solely to the dependent claims. Accordingly, because we affirm the Board's decision as to claim 1 of the '198 application, we also affirm the Board's decision as to the dependent claims.

Conclusion

In sum, the Board found that the prior art as a whole suggested or motivated a combination of the open perimeter of Bowerman with the hexagonal surface and facing orientation of Pope. Because this finding was supported by substantial evidence, we affirm the Board's rejection of the claims of the '198 application.

AFFIRMED